

EPA Region 5 Records Ctr.



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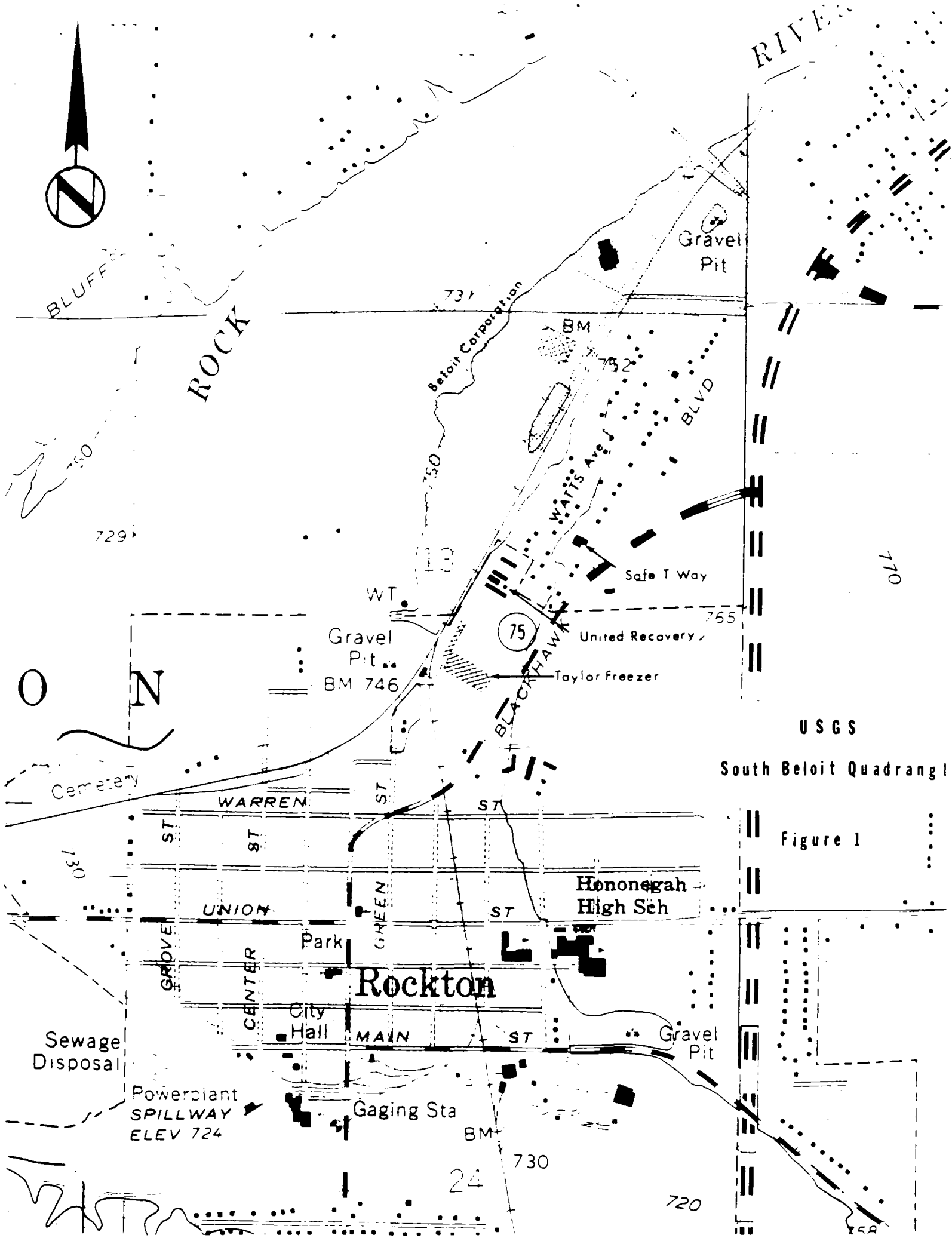
An Interim Study on Volatile
Organic Chemical Contamination in Groundwater
North of Rockton, Illinois

by

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USGS
South Beloit Quadrangle

Figure 1

Summary

The Illinois Environmental Protection Agency (IEPA) is conducting a special study of groundwater in the vicinity of Watts Avenue, north of Rockton, (see Figure 1) as part of a broader study of groundwater contamination in Winnebago County. The purpose of this special study is to identify the extent and source of groundwater contamination affecting private drinking water wells. Private well sampling conducted by the IEPA confirms the presence of volatile organic chemicals (VOC) in six private drinking water wells. Proposed drinking water standards* for tetrachloroethylene have been violated at two of these wells. One of these wells had concentrations of another organic compound equal to the proposed drinking water standard.

Determining the direction of groundwater flow is an essential part of this study. IEPA installed six monitoring wells and one piezometer to check the flow of groundwater. Water level readings were taken from these monitoring points and from existing wells on the property of the Beloit Corporation. Water level readings consistently showed a predominant southerly flow in the shallow aquifer.

Concurrently, IEPA has identified four potential sources of contamination in the immediate vicinity of Watts Avenue. These are: Safe-T-Way, Taylor Freezer, United Recovery/Solterion, and the Beloit Corporation. Two of these suspected sources, Safe-T-Way and United Recovery/Solterion, did not use hazardous substances that were detected in monitoring wells and drinking water wells from water sampling conducted to date by IEPA. Taylor Freezer does not use the two chemicals of most concern, tetrachloroethylene and 1,1-Dichloroethylene. Furthermore, Taylor Freezer is downgradient of the affected residential wells.

* The United States Environmental Protection Agency is in the process of proposing drinking water standards for some volatile organic chemicals. These proposed standards are based on risk assessments of contracting health problems from exposure to contaminated drinking water.

The Beloit Corporation is located upgradient of the affected drinking water wells and has handled or disposed of volatile organic chemicals found in drinking water wells. These same chemicals have also appeared in three monitoring wells on the the Beloit Corporation property. The IEPA monitoring well upgradient of the Beloit Corporation showed no contamination. All of the evidence gathered to date indicates the Beloit Corporation property as the source of volatile organic chemical contamination found in residential wells on Watts Avenue. The exact location or locations of these chemicals on the Beloit Corporation property is yet to be determined.

On September 29, 1986, officials of the Beloit Corporation met with the IEPA to discuss possible resolutions to the problem. Another meeting is scheduled and more information about what action the Beloit Corporation will take will be announced. The Beloit Corporation is being scored as part of the process for identifying sites that should be included in the federal Superfund program.

Introduction

Chemical contamination of drinking water has been found at several locations in Winnebago County during the past two years. This contamination has occurred in both private and public drinking water wells. Citizen concern about drinking water contamination near Rockton led to the release of money from the Environmental Protection Trust Fund to the Illinois Environmental Protection Agency (IEPA) to study chemical contamination of drinking water in Winnebago County.

In May, 1986, the IEPA designed a study to accomplish three objectives:

- 1) Identify the source or sources of chemical contamination in the area of Watts Avenue near Rockton.
- 2) Determine the extent of volatile organic chemical contamination in public water supplies.
- 3) Develop and conduct a water well survey to assess groundwater contamination sources near public water supplies.

As a result of this study, the IEPA defined the extent of volatile organic chemical contamination in public water supplies and identified the cause of contamination in private wells near Rockton.

The interim copy of this report describes the approach, activities, and results of the first objective.

Evaluation of Potential Contamination Sources

The drinking water from several private wells along Watts Avenue in Rockton Township was sampled by the Winnebago County Health Department in 1982 and found to contain man-made volatile organic chemicals. Further investigation of this area was conducted by the Winnebago County Health Department, Illinois Department of Public Health and the Illinois Environmental Protection Agency to determine the source of the contamination. Several companies in the vicinity of Watts Avenue were investigated: Safe-T-Way, Taylor Freezer, United Recovery, and Beloit Corporation.

Safe-T-Way is one block east of Watts Avenue at 918 North Blackhawk Boulevard and makes explosion proof gas cans. As a part of the manufacturing process the cans are rinsed with xylene which is reused. The only waste they dispose is paint sludge and this is collected twice a year and hauled to Wisconsin for disposal. Chemicals found in the groundwater are not used at this facility and therefore this company is not considered a source of the contamination.

Taylor Freezer makes soft drink and soft ice cream machines and is located south of the contaminated drinking water wells. This company has an air pollution control permit for their spray painting and degreasing operations. Trichloroethylene and methylene chloride waste are generated on-site in small quantities (less than 300 gallons per month). This waste is properly stored less than 90 days before being transported off-site by licensed haulers.

United Recovery located at the south end of Watts Avenue reclaimed metals from high speed cuttings and cooling oil waste from 1979 to 1984. The oil was sold or used on-site as fuel and the fine metal powder was sold to the steel industry for use as an alloy. Two types of wastes resulting from the recycling process included a fine powder residue and an oily waste water.

Investigations by IEPA noted oily soil, puddles and piles of waste powder at various locations on the plant property. The site owner claimed to have not used any chlorinated organic solvents but rather only inorganic powders and phosphate surfactants. None of the organic solvents were found in IEPA inspections. In 1984 the property was sold, cleaned, and is no longer used for waste recycling.

Beloit Corporation is located north and west of Watts Avenue at 1165 Prairie Hill Road. This facility manufactures machines that produce layered paper products from paper pulp. In addition to the manufacturing plant a research and development facility designs and demonstrates the paper making machines.

Wastewater from the pulp extraction was piped to a three cell percolation pond located north of the research and development facility. In 1981 the sludge from the percolation pond was applied to the land surface over 10 acres at the southern end of Beloit Corporation's property. Bottom sludge samples of the ponds were taken by the IEPA in 1983 contained 1,1,1-Trichloroethane (9 and 10 ppb), Dichloroethane (30 ppb), and Aliphatic hydrocarbons (270 ppb). Beloit Corporation analyzed a sample of their discharge influent to the ponds in May of 1983 and found 6.4 ppb of the chlorinated solvent Tetrachloroethylene. This concentration was assumed to be the average amount discharged over a 24 hour period. Beloit Corporation reportedly stopped using any chlorinated solvents during the summer of 1983 and switched to using Di-N-Octyl Phthalate. In 1984 a sample of the field paper fibers contained Tetrachloroethylene, 1,1,1-Trichloroethane, Benzene, Chloroform, Toluene, and Xylene.

On October 2, 1985 IEPA investigated barrels dumped on the Beloit Corporation property. The contents of four barrels were found spilled upon the soil. Samples of the spillage contained high levels of Methylene Chloride (20 ppm), Carbon Tetrachloride (130 ppm), Tetrachloroethylene (10 ppm), 1,1,1-Trichloroethane (20 ppm), Toluene (45,000 ppm), Ethyl Benzene (30,000 ppm), and Xylenes (120,000 ppm). Beloit Corporation was requested to clean up the drums and spillage.

Three of the monitor wells W-1, W-2, W-3 located on the Beloit Corporation property have been sampled semi-annually since February of 1984. The following chemicals have been detected: Trichloroethylene (6 to 142 ppb), 1,1,1-Trichloroethane (5 to 512 ppb), Tetrachloroethylene (6 to 18 ppb), 1,1-Dichloroethane (trace to 18 ppb), and Di-N-Octyl Phthalate 17.7 ppb.

Geological Setting

The study area lies over a valley cut deep into the bedrock by the ancestral Pecatonica River (See figure 2). During the Pleistocene, continental glaciers advanced and retreated several times through this area. The meltwaters from these glaciers left thick deposits of sand and gravel outwash in the valleys. Interbedded within these deposits are finer grained lacustrine (lake) sediments formed by the damming of the valleys by glacial ice. Thickness of these glacial deposits can be up to 250 feet in the deepest portions of the bedrock valley. (See figure 3)

On top of the glacial deposits are sediments that have been and are presently being deposited by the post glacial river systems of the Rock and Pecatonica Rivers. These river deposits (called alluvium) can vary in sediment size from fine clays (less than .002 millimeters) to gravels and boulders (larger than 1 millimeter). Over the years the progressive changes

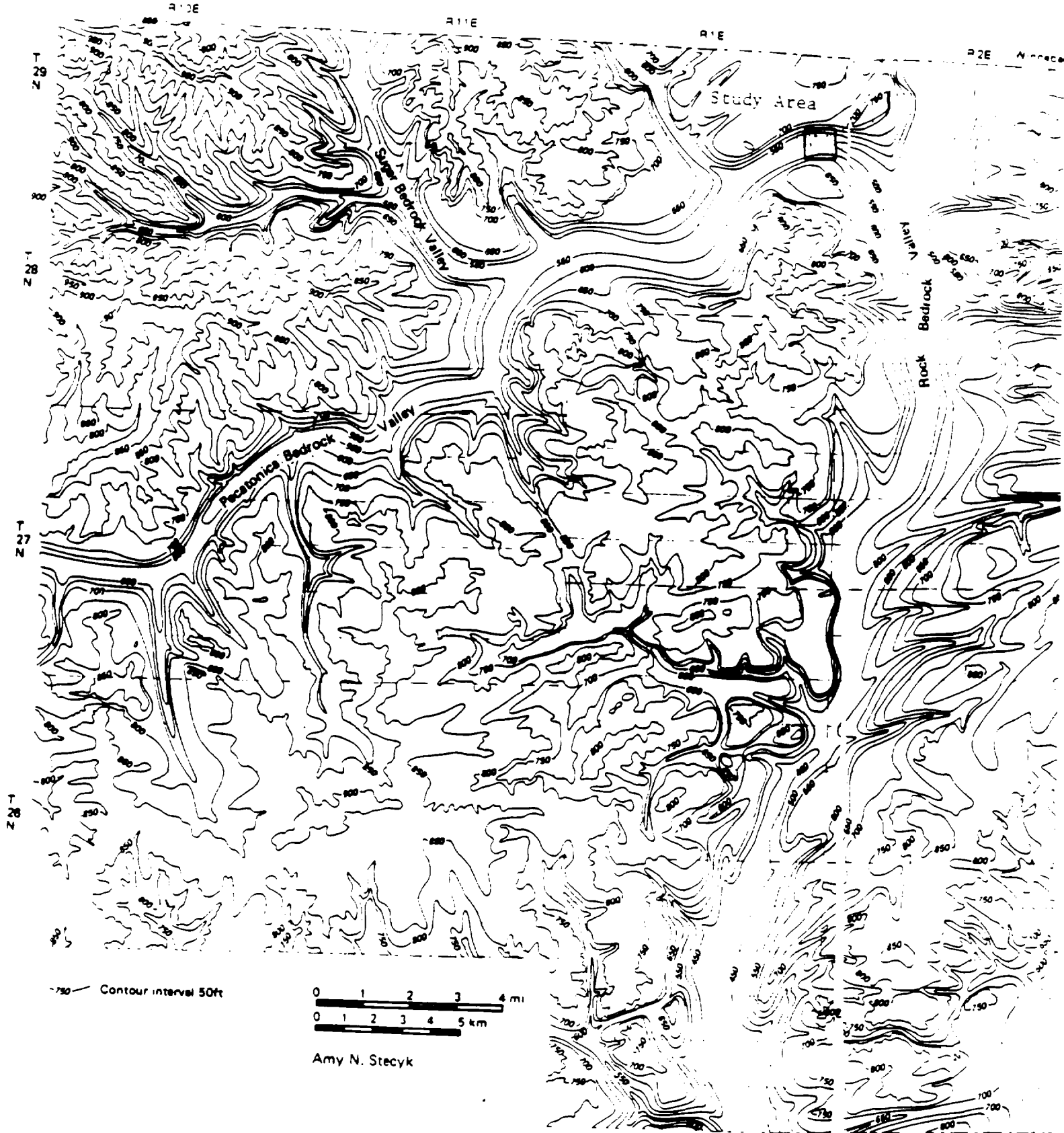


Figure 2: Topography of the bedrock surface of Winnebago County
 (Taken from ISGS Circular 531, Berg et al, 1984)

Figure 3f: Cross Section Through Ancestral Rock River Just South Of Rockton, Ill. (Taken from ISGS Circular 531, Berg et al, 1984)

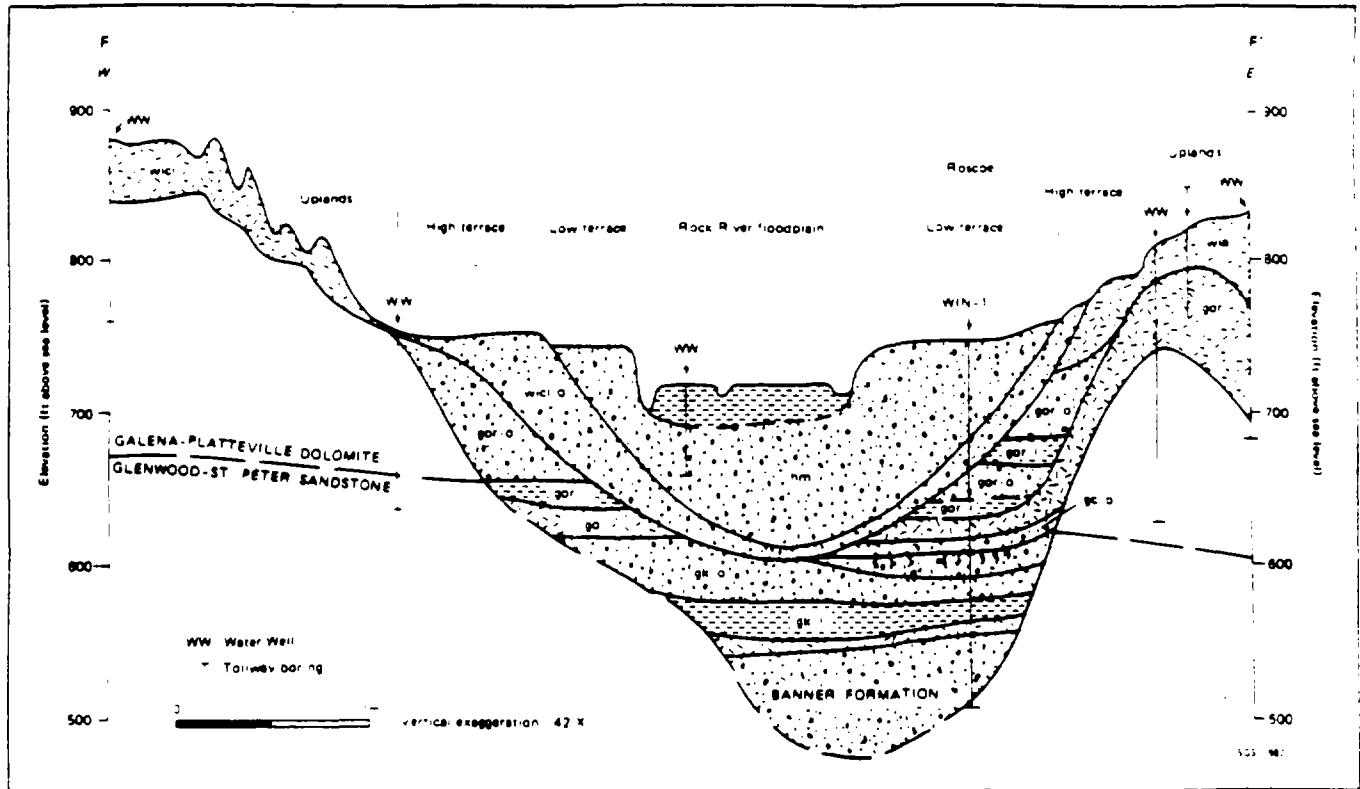
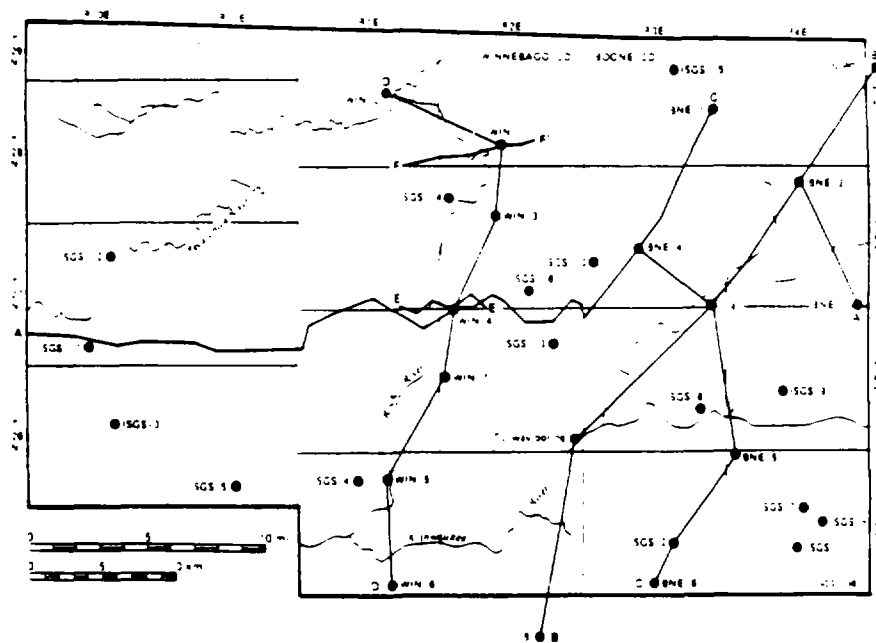
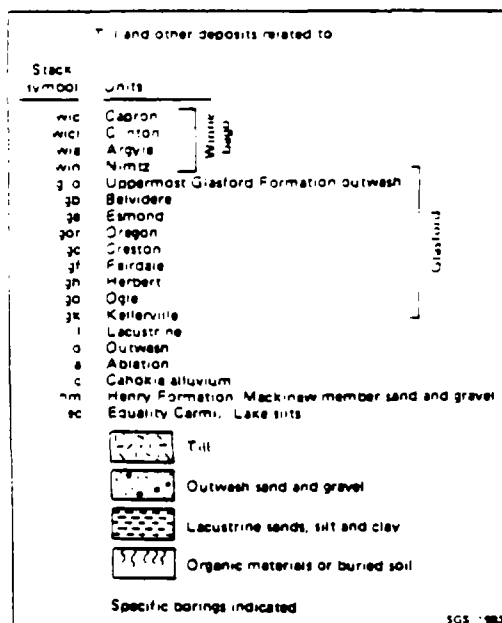


Figure 13f. W-E cross section across Rock River valley at Roscoe.

GEOLOGY FOR PLANNING IN BOONE AND WINNEBAGO COUNTIES



Legend for figures 13a-f. Generalized cross sections.

Location of test borings and lines of cross sections.

in the river's channel left buried sinuous channels consisting of the coarser sands and gravels throughout the river's valley. (See figure 4).

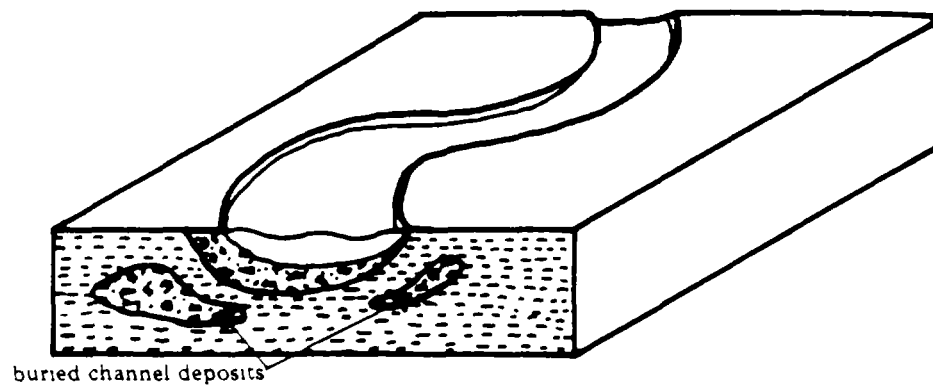
The glacial deposits have varying hydraulic conductivities. Hydraulic conductivity includes several factors that provides the rate at which water can move through a sediment. This rate in glacial deposits can roughly range from inches per day to greater than 250 feet per day. These deposits are shallow. Some portions can yield large quantities of water for private, municipal and industrial use. However, these coarser grained glacial deposits are susceptible to groundwater contamination because they are near the land surface. The State Geological Survey has designated this area as having a high potential for groundwater and surface water contamination due to the high porosity and hydraulic conductivities and the low attenuation capacities of these deposits (ISGS Circular 531, Berg et al, 1984). Attenuation refers to a variety of naturally occurring reactions in soil that have the effect of reducing the concentration of contamination.

The post glacial alluvium (river deposits) with the old buried river channels consisting of sands and gravels could also be an avenue for contaminants in the groundwater to follow.

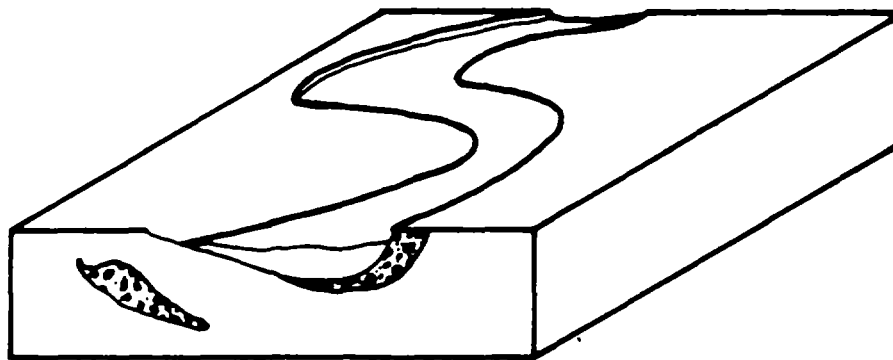
Method of Study and Local Hydrogeology

Beginning in June, 1986, the IEPA installed seven wells. Four wells are constructed of stainless steel casing and chemical analyses were conducted on groundwater samples from these wells. Stainless steel was used to minimize the effect of the well casing material on groundwater samples.

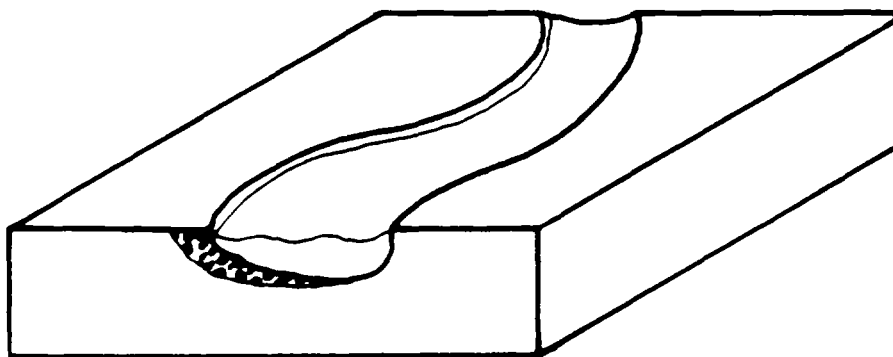
Three of the wells are constructed of PVC casing. These wells are used only to take water level readings. The general direction of groundwater flow



Present



Stage 2



Stage 1

Figure 4 : Deposits of coarse materials by meandering rivers.

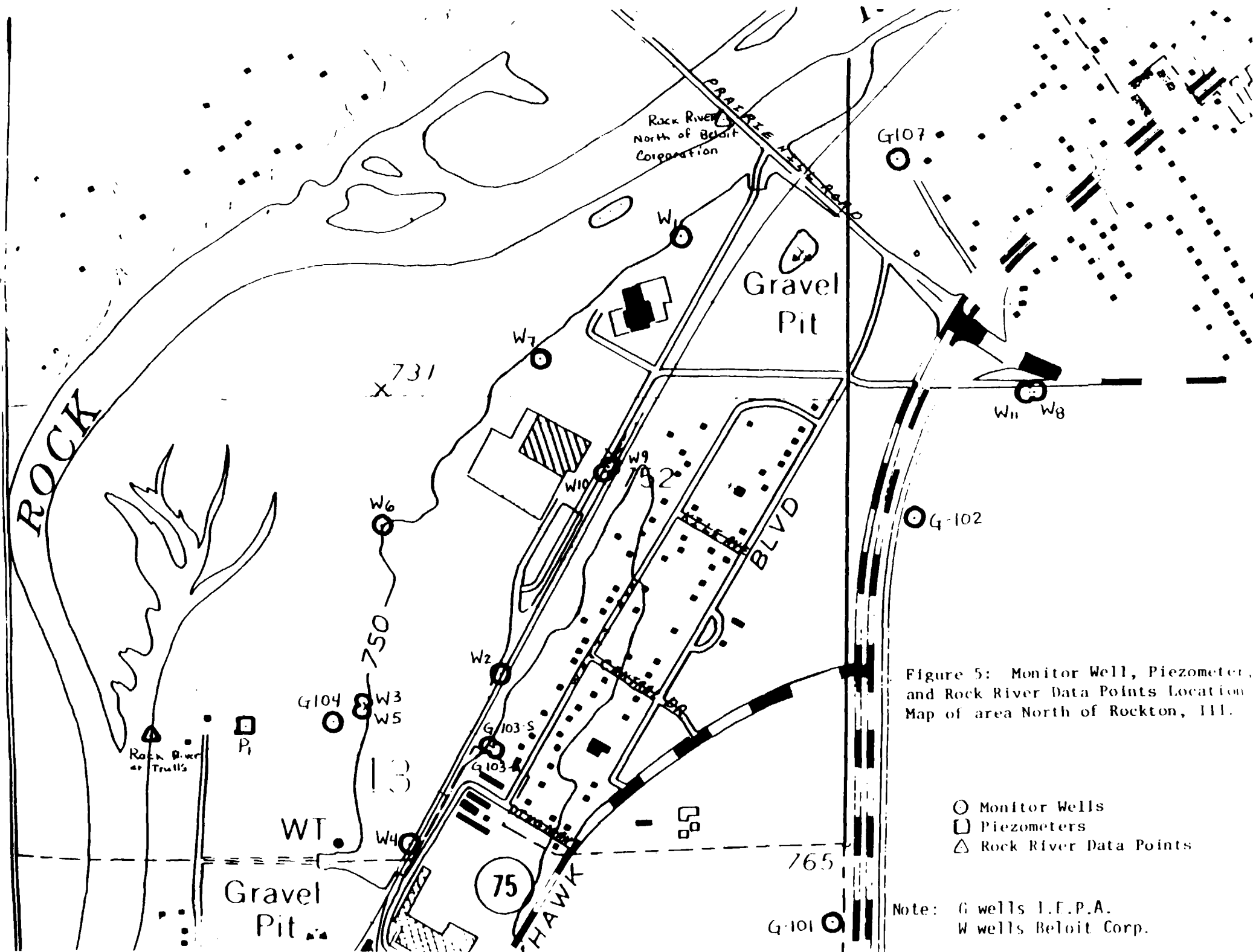
can be confirmed by taking groundwater level readings. PVC wells at the Beloit Corporation were also used for water level information in addition to the four stainless steel wells installed by IEPA. (See figures 5 and 6)

Groundwater flow in the shallow glacial aquifer for this particular area is mainly toward the south-southwest with local flow in the vicinity of the Rock River, toward the river. (See Table 1 and figures 7 through 11) Due to the proximity of the Beloit Corporation facility to the Rock River there is a local groundwater divide on the plant property. From the Corporation's Research and Development facility groundwater flow is in two directions. One is north and west toward the Rock River and the other south. All monitor wells on this property should be considered as downgradient wells. Only W-8 and W-11 and IEPA well G107 are true upgradient wells of this facility.

Chemical Analyses

A set of groundwater samples were taken from each of the stainless steel monitor wells for chemical analyses. Sixteen of the private drinking water wells in this area were also sampled. All of the samples were analyzed at the IEPA organic laboratory in Springfield for volatile organic chemicals (VOC's) only.

Of the sixteen residential drinking water wells tested by IEPA, six of the wells along Watts Avenue in the Blackhawk Subdivision had detectable concentrations of one or more VOC's. These chemicals and their concentrations are listed in Table 2. The Illinois Department of Public Health and the IEPA's Division of Public Water Supplies reviewed these results and agreed that residents at two households, 910 and 918 Watts, should seek an alternate source of drinking water. These two wells had concentrations of tetrachloroethylene at 45 ppb and 30 ppb respectively in addition to other



MONITOR WELL CONSTRUCTION

Figure 6

MONITOR WELL CONSTRUCTION

IEPA Monitor Wells and Piezometer

Table 1 : Groundwater Levels of the Shallow Glacial Aquifer North of Rockton, Illinois

Data Point	4/29/86	5/12/86	6/3/86	6/17/86	7/16/86
Beloit W-1	729.90	729.60	729.17	728.88	729.14
Beloit W-2	727.75	727.41	727.36	726.97	726.42
Beloit W-3	725.49	725.18	724.84	724.46	724.03
Beloit W-4	724.45	724.36	724.06	723.82	723.25
Beloit W-5	725.39	725.08	724.69	724.35	724.08
Beloit W-6	726.89	726.44	726.10	725.70	725.69
Beloit W-7	730.89	730.60	730.55	730.17	729.93
Beloit W-8	731.37	731.27	731.17	731.07	730.78
Beloit W-9	731.34	730.94	730.76	730.32	729.78
Beloit W-10	731.30	730.94	730.76	730.34	729.76
Beloit W-11	731.69	731.58	731.47	731.37	731.09
EPA P-1					
EPA P-1			724.48	724.10	724.05
EPA G101	725.55	725.40	725.12	725.96	724.43
EPA G102	730.89	730.76	730.62	730.47	730.16
EPA G103			727.51	727.02	726.33
EPA G103D					
EPA G104			724.71	724.34	724.07
EPA G107					730.62(7/17)
Rock River					
Trulls			725.28	725.10	725.70
N.of Beloit Corp		726.09	725.68	725.68	726.30

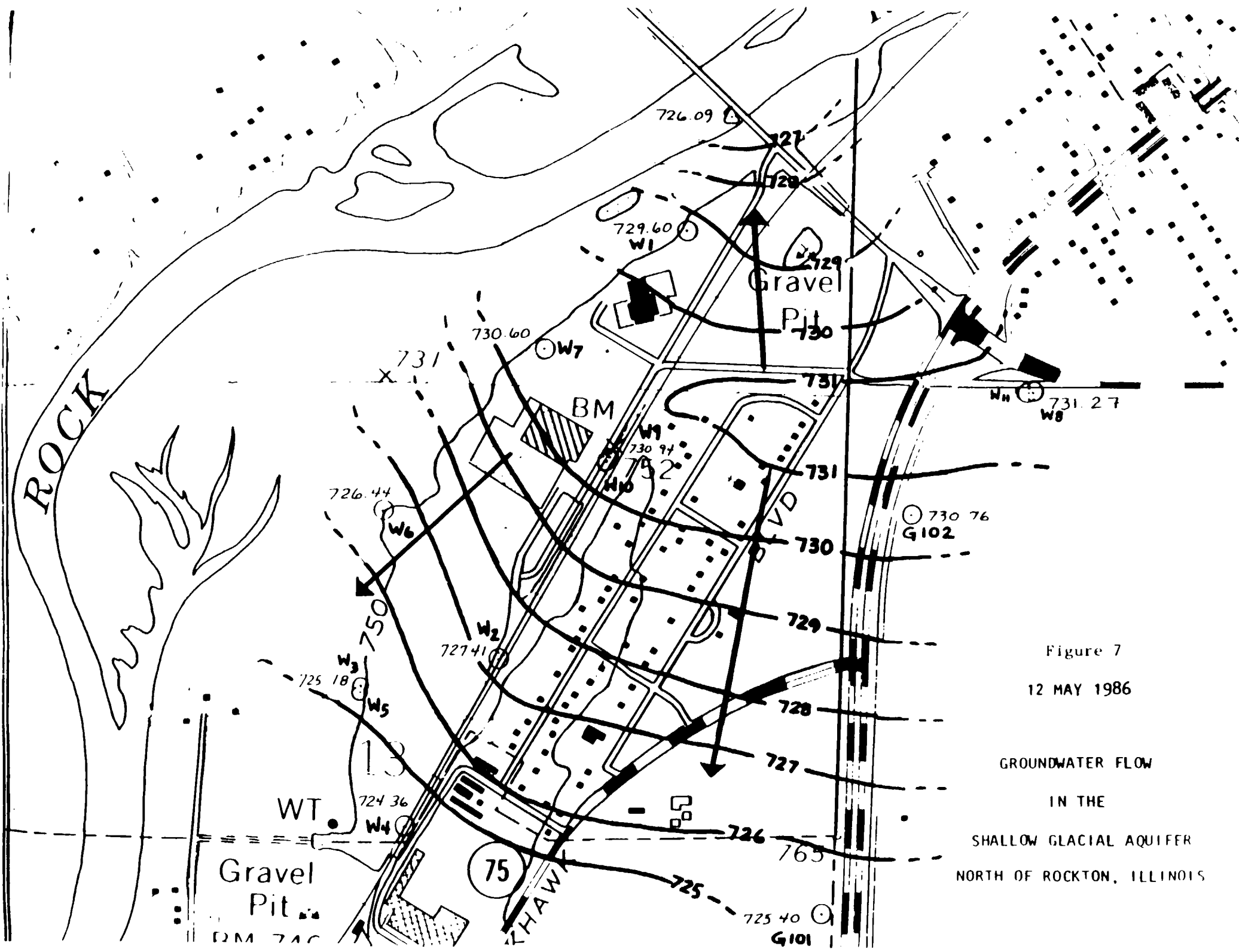
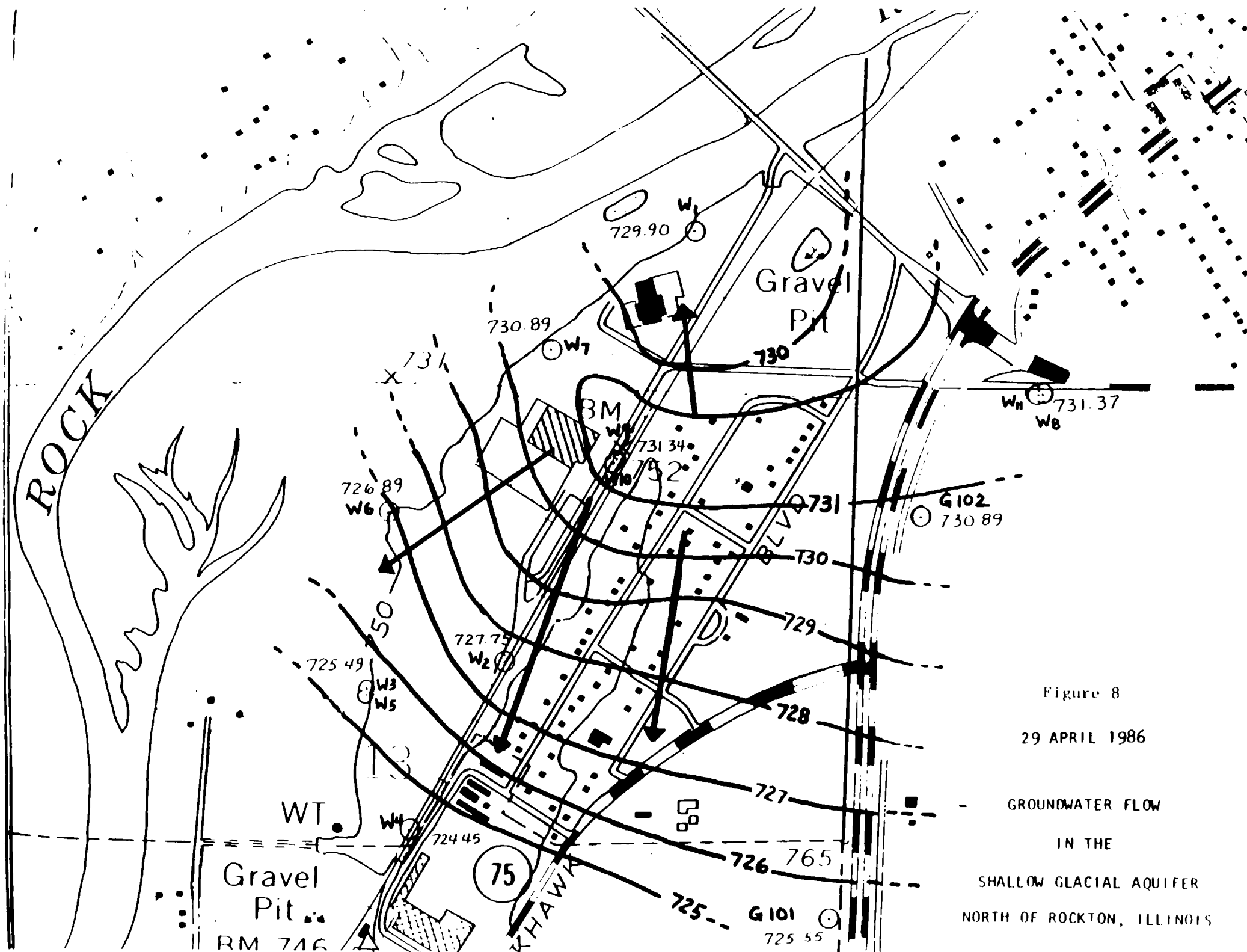


Figure 7

12 MAY 1986

GROUNDWATER FLOW
IN THE
SHALLOW GLACIAL AQUIFER
NORTH OF ROCKTON, ILLINOIS



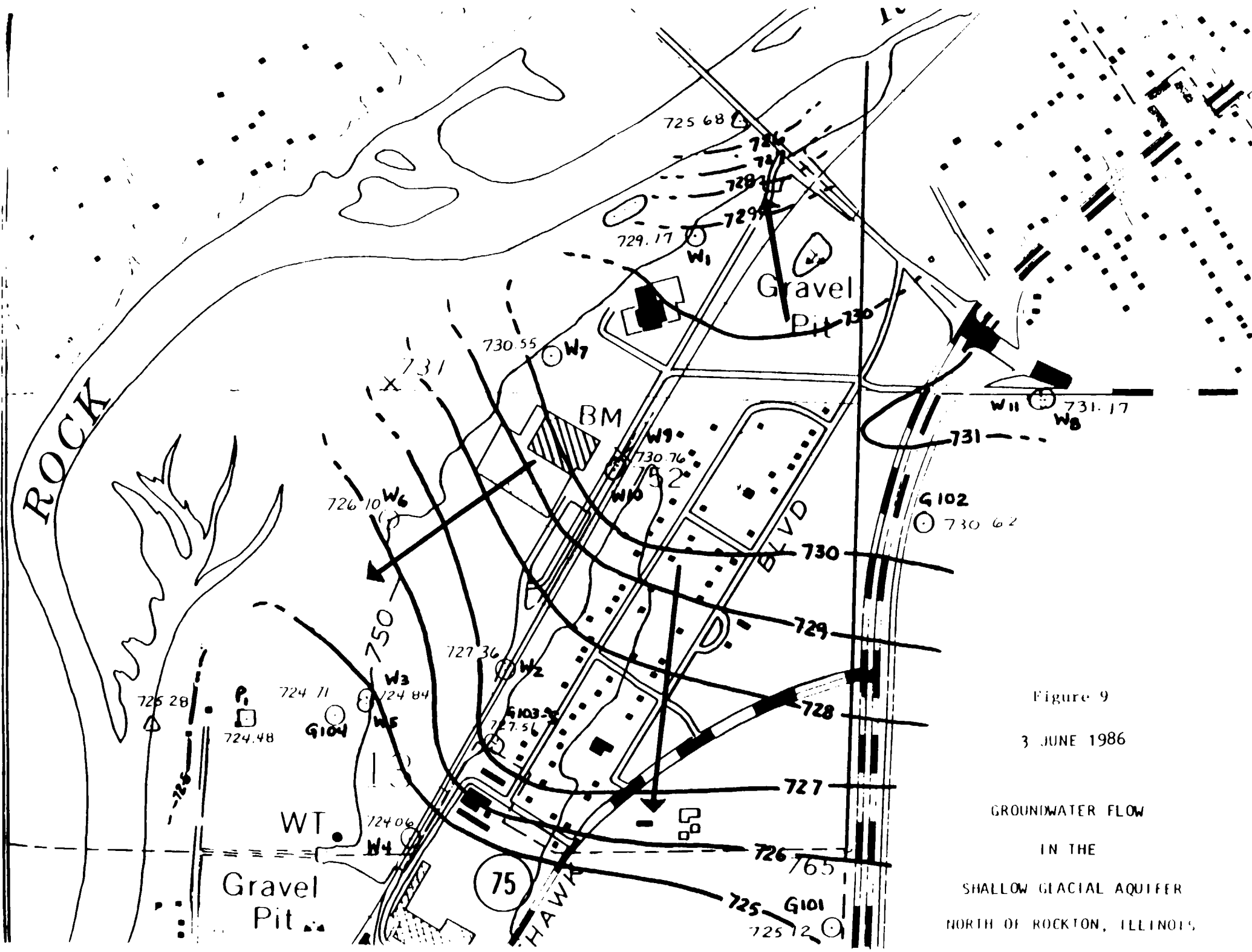


Figure 9

3 JUNE 1986

GROUNDWATER FLOW

IN THE

SHALLOW GLACIAL AQUIFER

NORTH OF ROCKTON, ILLINOIS

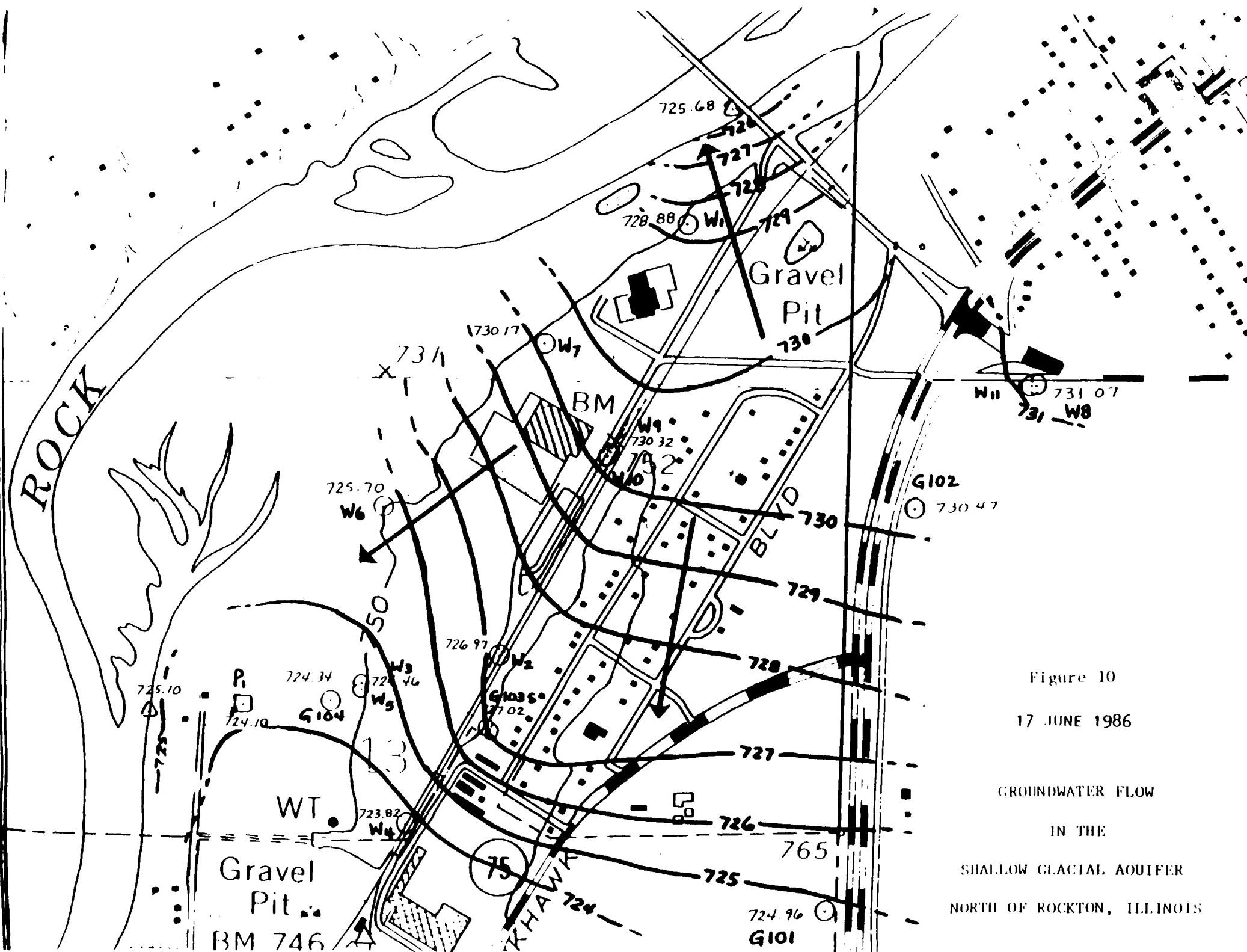


Figure 10

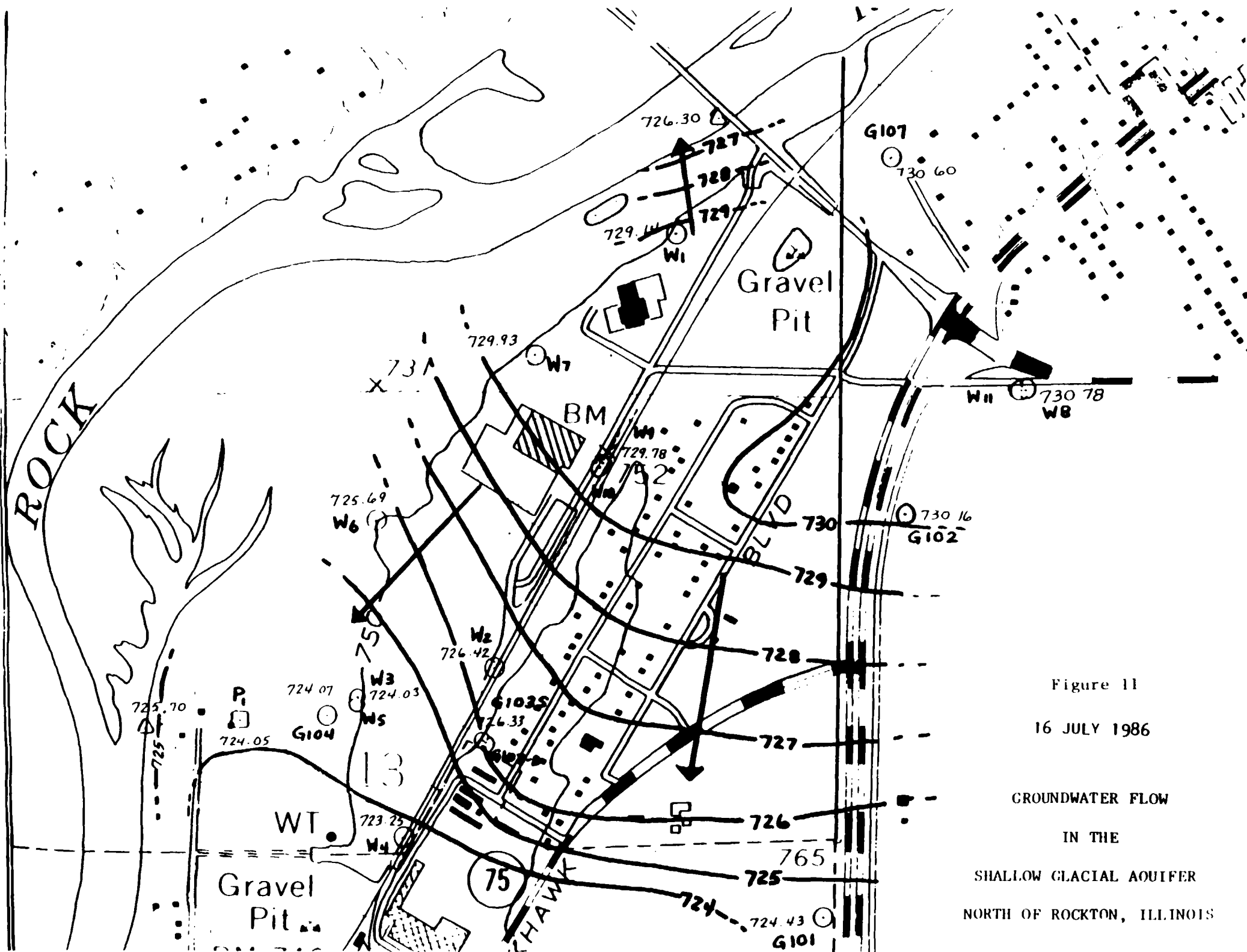
17 JUNE 1986

GROUNDWATER FLOW

IN THE

SHALLOW GLACIAL AQUIFER

NORTH OF ROCKTON, ILLINOIS



VOC's. This conclusion is based on several risk assessments performed on animals, and calculations to determine the increased risk in contracting a health problem from drinking contaminated water.

Monitoring well G104 also showed detectable concentrations of VOC's. Four VOC's were detected in this well at a cumulative concentration of 119 ppb. This is an excessive concentration and the water from this well would be considered unsafe to drink. Results from this monitoring well indicate that contaminants are leaving the Beloit Corporation property.

The VOC contaminants appear to be flowing in distinct pathways from the surface. (See figure 12) This is most likely due to the varying hydraulic conductivities of the heterogeneous deposits in this area. Through the clayey deposits groundwater will flow slower than through the coarser grained sands and gravels. This heterogeneity causes groundwater flow distortions and the contaminants will follow the deposits having the higher rate of flow. Therefore, contaminants are more likely to be found in the sands and gravels rather than the clayey deposits. Similar results were found in the VOC investigation at Hononegah Country Estates and Moore Haven Subdivision conducted by the State Water Survey (ENR Document No. 84/09, Wehrman, 1984). IEPA monitor well G103D encountered a clayey deposit from 35 feet to the bottom of the boring. This explains why contaminants were not detected in this monitor well, though private wells fifty feet away have VOC's present.

Conclusions

Prior to May of 1983 Beloit Corporation was disposing materials containing the following chemicals on-site: 1,1,-trichloroethane, trichloroethylene, tetrachloroethylene, dichloroethane, dichloroethylene. Groundwater flows from the Beloit Corporation north and west to the Rock River and south toward

Table 2 : Sampling points and Chemical Analyses

Location	Methylene Chloride	Chloroform	1,1,1-Trichloroethane	Tetrachloroethylene	1,1-Dichloroethylene	Trichloroethylene	1,1-Dichloroethane	Sampled VOC's Not detected
905 Watts			2	2				
909 Watts		1	1					
910 Watts			120	45	7	2		
913 Watts								X
914 Watts	2		60					
917 Watts								X
918 Watts			9	30				
1004 Watts			4					
1012 Watts								X
1018 Watts								X
1308 Watts								X
403 Dingham								X
409 Dingham								X
908 Blackhawk								X
900 Prairie								X
903 Prairie								X
G103								X
G103D								X
G104			90	4		10	15	
G107								X

USEPA Proposed maximum contaminant levels

Note: Above Analyses reported in ppb.

1,1,1-Trichloroethane 200 micrograms per liter (ppb)
Tetrachloroethylene(PCE) 5 micrograms per liter
1,1-Dichloroethylene 7 micrograms per liter
Trichloroethylene (TCE) 5 micrograms per liter
1,2, Dichloroethane 5 micrograms per liter (1,1-Dichloroethane is not listed)

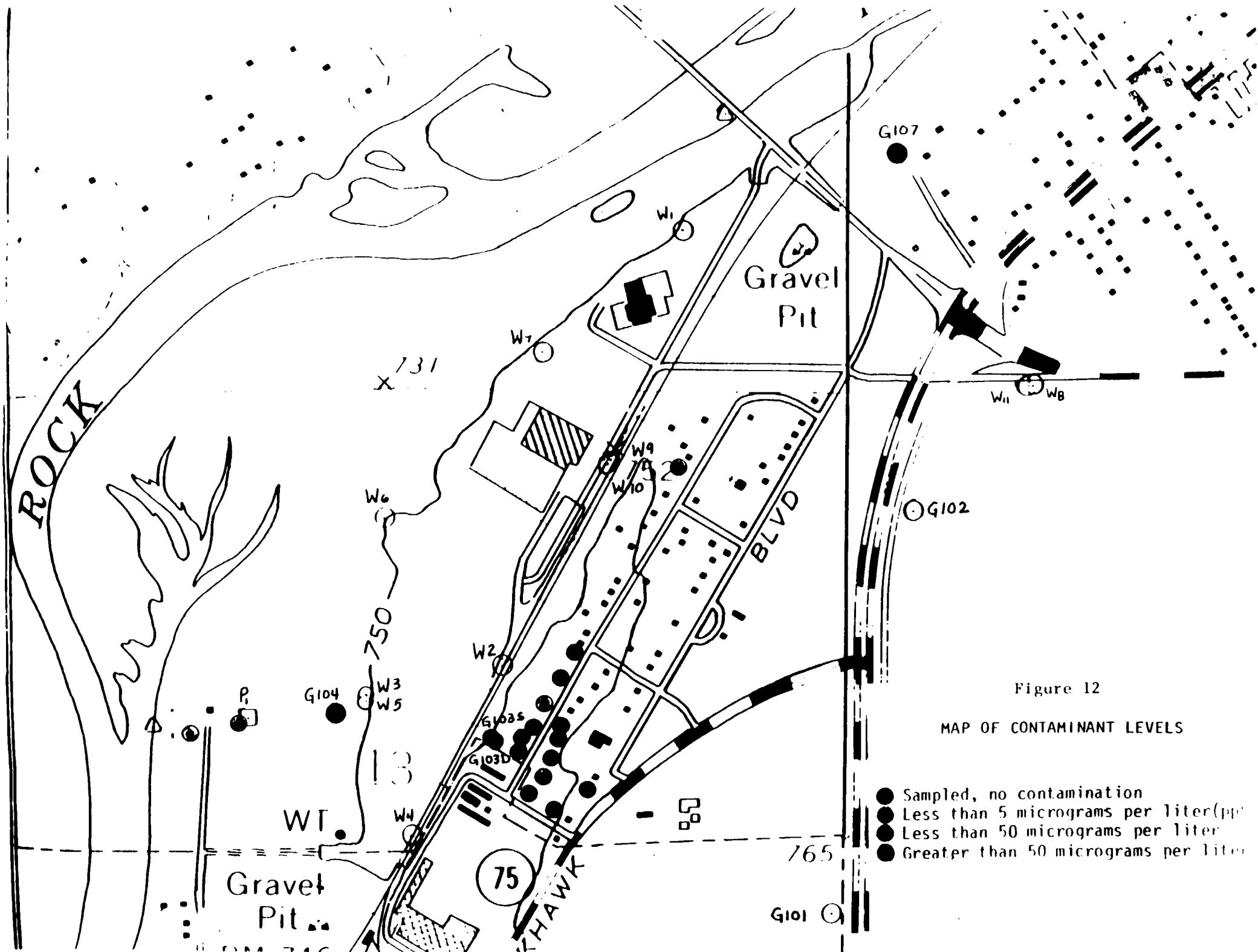


Figure 12

MAP OF CONTAMINANT LEVELS

Blackhawk Subdivision. These chemicals reached the groundwater and have migrated through the coarser gravels. Six private drinking water wells have been confirmed by IEPA sampling to contain detectable concentrations of at least one of the volatile organic chemicals by the Beloit Corporation.

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